PCI Ethernet and Fast Ethernet Adapters

User's Guide

adaptec®

PCI Ethernet and Fast Ethernet Adapters
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- Adaptec USA Bulletin Board Service (BBS) at 408-945-7727; supports up to 28,800 bps (bits per second), 8 data bits, 1 stop bit, no parity. No product literature is available on the Adaptec BBS.
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Federal Communications Commission Radio Frequency Interference Statement

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian Compliance Statement

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matérial brouilleur du Canada.

European Compliance Statement

WARNING:This is a Class A product. in domestic environments this product may cause radio interference in which case the user may be required to take adequate measures.

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Federal Communications Commission Radio Frequency Interference Statement

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- Reorient or relocate the receiving antenna.
- Increase the separation between equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Use a shielded and properly grounded I/O cable and power cable to ensure compliance of this unit to the specified limits of the rules.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Adaptec, Inc.

ANA-6911A/TX
ANA-6911A/TXC
ANA-6901
ANA-6901/C

Tested To Comply With FCC Standards

FOR HOME OR OFFICE USE

Canadian Compliance Statement

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matérial brouilleur du Canada

European Compliance Statement

WARNING: This is a Class B product. In domestic environments this product may cause radio interference in which case the user may be required to take adequate measures.

Safety Standards

These products meet the following national and international regulations:

- UL 1950 Standard for Safety of Information Processing and Business Equipment
- IEC 950 Safety of Information Technology Equipment in Electrical Business Equipment

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- CAN / CSA-C22.2 # 950 Safety of Information Technology Equipment including Electrical Business Equipment

To ensure safe operating conditions, it is recommended that these products be installed in UL Listed computers.

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1

Getting Started

This document contains information about installing and configuring the Adaptec® LAN adapters. These adapters are engineered for high-speed networking in IEEE 802.3 Ethernet and IEEE 802.3u Fast Ethernet networks.

Procedures in this document describe installing the adapter, installing and configuring the adapter drivers, and troubleshooting the Adaptec LAN adapters.

System Requirements

The minimum system requirements for using the Adaptec LAN adapters and for running the *EMDIAG* Diagnostics Utility are as follows:

System Component	Requirements
PCI adapter	Available bus mastering PCI slot; most recent PCI system BIOS recommended
Quartet adapter with Windows NT	System BIOS supporting PCI-to-PCI bridge chip
EMDIAG program	MS-DOS 3.3 or later

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What You Need to Know

You should have basic knowledge of Ethernet networking. In addition, you must:

- Determine the speed of your network: 10 Mb/s or 100 Mb/s.
- Determine if the device you are connecting the adapter to is a full-duplex or half-duplex device.
- Identify your adapter model. If you are not sure, look on the adapter.
- Identify the type of network operating system that you will be using.

Conventions

The following typographic conventions are used in this document:

Bold	Used for keystrokes (press the **Enter** key) and for options you are directed to select from a menu or list (select **Configuration Status** from the main menu).
Helvetica	Used for operator entry that you must type exactly as shown (a:\emdiag) and for messages that appear on the screen (Performing Automatic Media Detection).
Helvetica Italics	Used as a place holder for text you must determine and type (*drive* = boot drive letter) and for program and file names that appear in body text (the *readme.txt* file).

Advisories

Always use care when handling any electrical equipment. To avoid injury to people or damage to equipment and data, be sure to follow the cautions and warnings in this document.

Note: Notes are reminders, tips, or suggestions that might simplify the procedures included in this document.

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Caution: Cautions alert you to actions that might cause damage to your system or your data.

WARNING: Warnings alert you to actions that might cause injury to you or someone else.

Adaptec does not claim to have included in this document every condition or situation that might require a caution or warning notice. Be sure to consult the documentation for your computer and any connected equipment when you are installing the equipment or changing its configuration.

WARNING: *Always* use caution when handling electrical equipment!

Fast Ethernet

Fast Ethernet is a networking standard defined by the Institute of Electrical and Electronic Engineers (IEEE) in their IEEE 802.3u Specification. Fast Ethernet runs at 100 Mb/s or 200 Mb/s in Full Duplex mode.

Fast Ethernet uses the same Carrier Sense Multiple Access with Collision Detection (CSMA/CD) architecture used on 10BASE-T and 10BASE-2 10 Mb/s network specifications, which allows for easy integration with existing networks.

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IEEE 802.3u encompasses three different cable specifications: 100BASE-T4, 100BASE-TX, and 100BASE-FX.

	100BASE-T4	100BASE-TX	100BASE-FX
Cable supported	CAT 3,4,5 UTP	CAT 5 UTP	62.5/125m. multimode fiber
Number of Cable pairs	4	2	1
Node-to-repeater cabling distance	100 meters	100 meters	137 meters
Node-to-switch to full duplex	100 meters	100 meters	2000 meters

10/100 Autosensing Models

All 10/100 models support autosensing between 10 and 100 Mb/s line speeds; no adapter configuration is necessary.

Quartet Adapters

The Adaptec Quartet adapters provide four separate Fast Ethernet segments on a single adapter. Each segment runs at full cable speed. Selected models support per port autosensing between 10 and 100 Mb/s line speeds.

Ultimate Combo Adapter

The Adaptec Ultimate Combo adapter supports both the 100BASE-T4 and the 100BASE-TX Fast Ethernet standards, including autosensing, on the same adapter. The Ultimate Combo also supports standard 10 Mb/s Ethernet via UTP, BNC, and AUI cable ports.

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Installing Your Adapter

This chapter describes how to install and configure your Adaptec adapter in your computer.

Before You Begin

Determine the model of your Adaptec (PCI) adapter by looking at the model name on the adapter. After turning OFF your PC's power supply and removing the power cable, remove the cover from your PC. Find an empty PCI slot.

Note: PCI slots and adapters come in two varieties, 3.3 volt and the more common 5 volt. All Adaptec PCI adapters support 5-volt slots. Some models also support 3.3-volt slots.

Installing the Adapter

WARNING: Before you unpack your adapter or install it in your computer, make sure you are grounded to avoid damaging any highly static-sensitive components on the adapter or your computer. To reduce your static electricity, touch your computer's metal chassis and then maintain grounding by wearing a wrist strap attached to the chassis or other ground.

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1. Turn OFF your computer and unplug it from its power source.
2. Disconnect all cables connected to your computer.
3. Remove any jewelry from your hands and wrists.
4. Using insulated or nonconducting tools, unscrew your computer's cover from the chassis.
5. Carefully lift the adapter out of its antistatic container. Check the adapter for any visible signs of damage which may have occurred during shipment.

   If you find a problem, immediately notify your network supplier and the shipping service which delivered your adapter.

Note: Adaptec PCI adapters require a bus mastering slot.

6. Remove the metal guard from the back of the expansion slot.
7. Holding the adapter by its metal bracket, carefully insert the adapter into the expansion slot. Make sure the board is inserted all the way into the slot. Both rows of gold fingers must be fully seated in the PC connector.
8. Secure the adapter in the expansion slot with the screw used for the metal guard.
9. Screw the computer's cover back on the computer.
10. Reconnect all devices and cables. See Chapter 3, *Connecting to Your Network Cable* for more information on network cabling.
11. Configure the adapter as described in *Configuring the PCI Adapter* on page 2-2 or *Configuring Quartet Adapters* on page 2-4.

Configuring the PCI Adapter

Your PCI computer's BIOS determines available adapter resources and configures the Adaptec PCI adapters automatically. However, depending on your system, you may need to configure your motherboard, PCI BIOS, or both.

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PCI BIOS Settings

PCI BIOS configuration options vary widely by system. The following section discusses representative PCI configuration options, but may not exactly match your computer. (Some computer BIOSs provide no PCI configuration options, but instead automatically configure all PCI settings. Your BIOS may not provide the options described below). We recommend that you configure all PCI slots in your system, even those not currently in use, for later convenience. Enter your computer BIOS Setup, and select **Advanced Settings** from the Main Menu.

PCI Slot Enabled	Use this setting to enable all PCI slots in your system.
Bus Mastering	Use this setting to enable PCI bus mastering.
PCI INTA	Use this setting to assign an ISA interrupt (10, 11, 12, etc.) to PCI Interrupt Vector A.
PCI INT Vector	Use this setting to assign PCI Interrupt Vector A to the PCI slot(s).
PCI Bus Latency	Configure this setting to a value between 40 and 80.

PCI Interrupts

PCI uses an interrupt architecture that maps PCI interrupts to regular ISA interrupts. Some PCI BIOSs will refer directly to the numeric ISA interrupts (i.e., 10, 11, 12) for PCI slots. Other BIOSs will refer to the PCI interrupt used by the slot (i.e., INTA, INTB, INTC, INTD). All Adaptec PCI adapters use the PCI interrupt INTA, and the ISA interrupt to which it is mapped.

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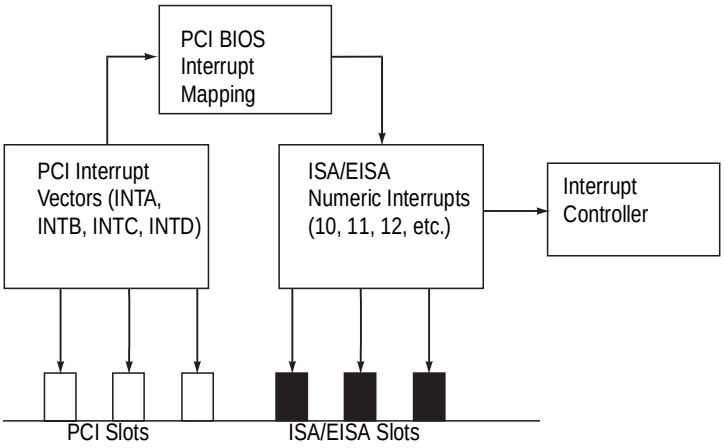

Configuring Quartet Adapters

Quartet adapters use the resources of a single adapter to provide four separate Fast Ethernet segments. A Quartet adapter requires a PCI slot with enough room to accept a full length adapter. Follow the instructions above for configuring a single port PCI adapter to install and configure your Quartet.

If you are planning to use the Quartet adapter with Windows NT or Windows 95, please see the discussion of PCI-to-PCI bridge chips below.

PCI-to-PCI Bridge Chip

Quartets use the DEC® PCI-to-PCI bridge chip to increase the capacity of PCI computers by adding an additional PCI bus to the existing motherboard. Some older system BIOSs fail to configure a Quartet adapter properly, because the BIOS does not recognize the PCI-to-PCI bridge chip. Such BIOSs need to be upgraded with a new BIOS from the computer manufacturer before the system can be used with Windows NT or Windows 95.

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Testing the PCI Configuration

Use *EMDIAG* to make sure the PCI adapter is configured properly. For more information about *EMDIAG*, see Chapter 5, *Using EMDIAG to Troubleshoot Problems*.

1. Type A:\EMDIAG and press **Enter** to start the Adaptec setup program.
2. At the Main Menu, select **Configuration Status**.
3. The Configuration Status screen reports the resources in use by the adapter.If the adapter has encountered a resource conflict with another adapter, or is not yet fully configured, *EMDIAG* displays an error message.

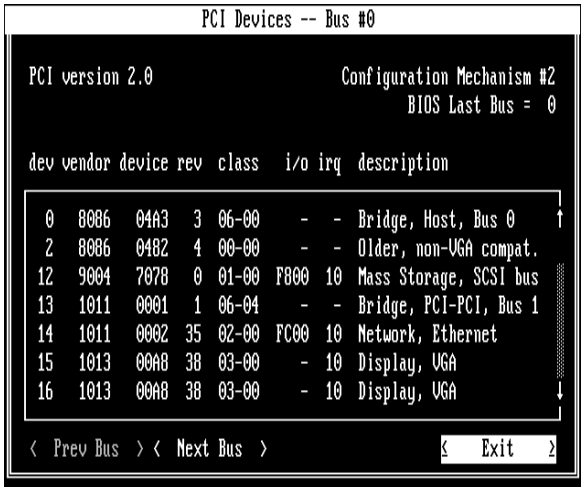
   Try repeating the installation and configuration procedures again. If you still have difficulties, refer to Chapter 5, *Using EMDIAG to Troubleshoot Problems*.

Testing the Quartet Configuration

If you are planning to use your quartet with Windows NT you must first determine if your system's BIOS supports the PCI-to-PCI bridge chip.

1. At *EMDIAG*'s Main Menu, select **PCI Device Information**.

   A screen similar to the following appears:


PCI Devices -- Bus #0
PCI version 2.0
Configuration Mechanism #2
BIOS Last Bus = 0
dev vendor device rev class i/o irq description
0 8086 04A3 3 06-00 - - Bridge, Host, Bus 0
2 8086 0482 4 00-00 - - Older, non-VGA compat.
12 9004 7078 0 01-00 F800 10 Mass Storage, SCSI bus
13 1011 0001 1 06-04 - - Bridge, PCI-PCI, Bus 1
14 1011 0002 35 02-00 FC00 10 Network, Ethernet
15 1013 00A8 38 03-00 - 10 Display, VGA
16 1013 00A8 38 03-00 - 10 Display, VGA
< Prev Bus > < Next Bus >
< Exit >

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Note: If your system's BIOS does not support the PCI-to-PCI bridge chip, an error message will appear. Contact your computer manufacturer to obtain a new BIOS version that supports the PCI-to-PCI bridge chip.

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3

Connecting to Your Network Cable

Cable Requirements

Cable requirements for Adaptec adapters vary according to network speed, cabling standard, and the connector to be used. The chart below identifies appropriate cabling, based on these variables. The chart applies to both Half Duplex and Full Duplex (for selected models) environments.

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	Connector	10Mbps	100Mbps	Cable Pins Used
T4 Adapters	RJ-45	CAT 3,4, 5 UTP	CAT 3,4,5 UTP	1 through 8[1]
TX Adapters (including Quartet)	RJ-45	CAT 3,4, 5 UTP	CAT 5 UTP,	1,2,3 and 6
FX Adapters	ST	N/A	62.5/125 micron multimode fiber	N/A
	SC	N/A	62.5/125 micron multimode fiber	N/A
Ultimate Combo	RJ-45 (in T4 mode)	CAT 3,4, 5 UTP	CAT 3,4, 5 UTP	1 through 8[1]
	RJ-45 (in TX mode)	CAT 3,4, 5 UTP	CAT 5 UTP	1,2,3 and 6
	BNC	RG-58 Coax	N/A	N/A

[1] All adapters in 10 Mb/s mode and TX adapters in both 10 Mb/s and 100 Mb/s mode use pins 1,2,3 and 6 to transmit data of the RJ-45 connector. However, all pins must be connected. T4 adapters use all pins to transmit data. See the following section, *Pinout & Color Requirements*, for pinout information.

[2]Available only for Combo verions.

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Pinout and Color Requirements

The following chart provides cable pinout and color information.

Straight-Through Cable - 10BASE-T, 100BASE-TX, or 100BASE-T4	
Pin	**Colors - Both Ends**
1	Orange White
2	Orange
3	Green White
4	Blue
5	Blue White
6	Green
7	Brown White
8	Brown

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Crossover Cable - 10BASE-T, 100BASE-TX, 100BASE-T4		
	Pinout	
	End One	**End Two**
	Pin 1	Pin 3
	Pin 2	Pin 6
	Pin 3	Pin 1
	Pin 4	Pin 7
	Pin 5	Pin 8
	Pin 6	Pin 2
	Pin 7	Pin 4
	Pin 8	Pin 5
	Color	
Pin	**End One**	**End Two**
1	Orange White	Green White
2	Orange	Green
3	Green White	Orange White
4	Blue	Brown White
5	Blue White	Brown
6	Green	Orange
7	Brown White	Blue
8	Brown	Blue White

Connecting the Cable

After making sure you have appropriate cabling, connect the cable to the adapter connector. (For Quartet adapters, connect up to four cables.)

Connecting the Quartet

Each Quartet adapter provides four separate connectors that can be used in any combination. If you load a Quartet network driver on a port that does not have a cable attached, you may receive a startup message on your server. This is normal and does not affect performance. To prevent this message, do not load the driver on a port unless a cable is attached.

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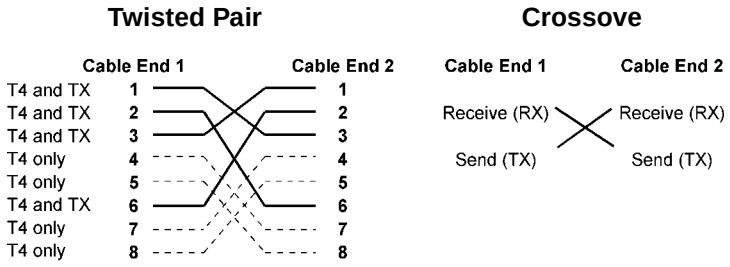
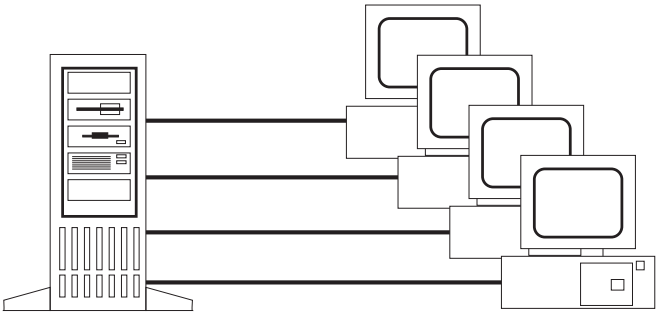
Crossover Cables

A twisted pair or fiber optic crossover cable allows you to connect servers and workstations directly, without the use of a hub. When using crossover cables, we recommend you override line speed autosensing by selecting either 10 Mbps or 100 Mbps in your driver configuration. See Chapter 4, *Installing Network Drivers*, and Appendix B, *Cables*, for more information.



A simple network can be made by connecting a Quartet server directly to four workstations via crossover cables.



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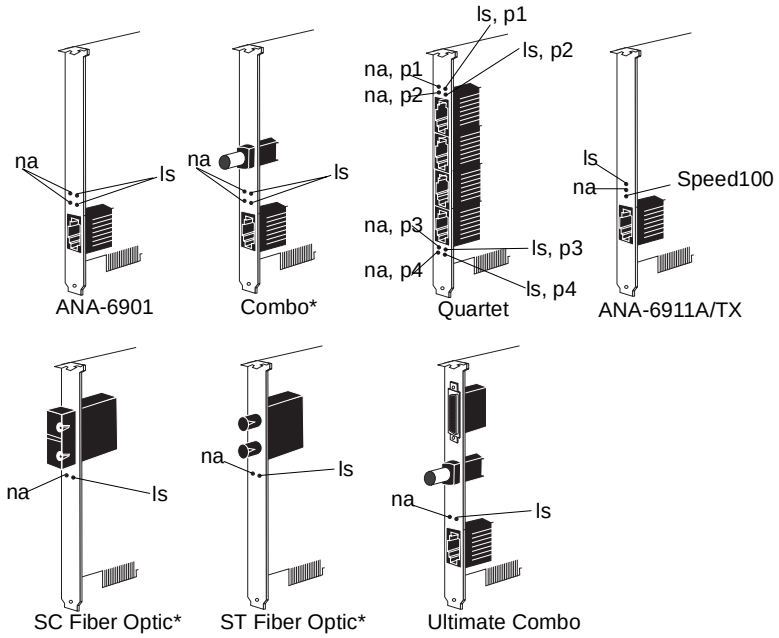
Diagnostic LEDs

Diagnostic Light Emitting Diodes (LEDs) provide information about link status and network activity. See the table below for details on each LED function.



*10Mbps and 100Mbps single speed adapters provide only 1 link status and 1 netwc

Link Status (L.S.)		
LED lights when the adapter's driver is loaded, and indicates that an electronic link exists between the adapter device and repeater or switch.		
Speed	**Ports**	**Color**
10 Mbps	RJ-45	Green, with the exception of the Quartet and the Ultimate Combo—where it is yellow.
100 Mbps	RJ-45	Green. The LED blinks on T4 adapters.
Network Activity (N.A.)		
LED lights up to signal the presence of incoming or outgoing traffic.		
Speed	**Ports**	**Color**
10 Mbps	RJ-45, BNC, AUI	Yellow
100 Mbps	RJ-45, BNC, AUI	Yellow
Speed100 (ANA-6911A/TX)		
The Speed100 LED is green. When ON, it indicates 100Mb/s, when OFF, it indicates 10Mb/s.		

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Checking the Connection with EMDIAG

After connecting the network cable to the adapter, use the *EMDIAG* diagnostics utility to test your connection. For more information about *EMDIAG*, see Chapter 5, *Using EMDIAG to Troubleshoot Problems*.

1. Type A:\EMDIAG and press **Enter** to start the Adaptec setup program
2. At the Main Menu, select **Diagnostics**.
3. At the Test Options Menu, select **Local Diagnostics**.
4. Use the Tab key to select **<Start>** and press **Enter**. *EMDIAG* runs a series of tests on the installed adapter, including sending a series of test packets.

If any of these tests fail, then a problem exists, possibly with the network cable or the connection.

In the event of a failure:

1. Exit from *EMDIAG*.
2. Remove the cable from the adapter.
3. Reattach the cable.
4. Reboot.
5. Run *EMDIAG*.

If a failure still occurs, see Chapter 5, *Using EMDIAG to Troubleshoot Problems*, for additional troubleshooting tips.

Note: *EMDIAG* runs on only one adapter at a time. To learn how to specify individual Adaptec PCI adapters with *EMDIAG* when more than one exists in a system, see Chapter 5, *Using EMDIAG to Troubleshoot Problems*.

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4

Installing Network Drivers

The Adaptec setup diskette included with your adapter contains network drivers for most popular environments. Depending on your adapter, the Adaptec setup diskette provides drivers for Novell NetWare, Windows NT, LAN Manager, Windows for Workgroups, Windows 95, IBM OS/2 Warp, and more. Additional drivers are available directly from Adaptec or your operating system vendor. See the *\readme.txt* file for details.

Always use the latest driver version available for your adapter. Drivers are updated regularly on Adaptec's World Wide Web, FTP, BBS, and CompuServe forum sites to provide enhanced performance and new features. See *Technical and Product Support* on page ii.

Installation Instructions and Optional Keywords

Installation, configuration, and optional parameters for the drivers are updated regularly. The *\readme* subdirectory contains supplemental installation instructions, as well as information about optional driver keywords.

Driver Naming Conventions

PCI and Quartet adapters use the EMPCI driver.

Full Duplex Support

To implement Full Duplex on your network, you need both an adapter and a switch that support Full Duplex. Full Duplex support allows an adapter to send and receive data at the same time, doubling available bandwidth. Servers tend to benefit from Full Duplex,

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because they must respond to requests from many workstations simultaneously.

Note: Full Duplex can also be enabled point to point with a crossover cable instead of a switch.

Installation instructions in this chapter describe how to enable Full Duplex. Additional information can be found in the *\readme.txt* file.

Adaptec PCI 10 Mb/s adapters support Full Duplex on twisted-pair cabling; Adaptec PCI TX adapters support Full Duplex at both 10 Mb/s and 100 Mb/s; Adaptec PCI T4 adapters support Full Duplex at 10 Mb/s only.

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NetWare

Note: Consult *\readme\nw_stnd.txt* and *readme\nw_dura.txt* files for the latest driver information and installation instructions. Some procedures or information may have changed or may not have been available at the time this user's guide was printed.

The Novell NetWare driver, *\nwserver\empci.lan* is used with both NetWare 3.1x and NetWare 4.x servers, and also with both NetWare 3 SFT III and NetWare 4 SFT III.

Note: An Adaptec LAN adapter cannot be used as an MSL adapter in an SFT-III environment.

Note: These instructions apply to standard drivers only. If your adapter shipped with Duralink software, see *Installing the Duralink Driver for NetWare 4.x* on page 4-5 or *\readme\nw_dura.txt*.

Installing and Configuring the Standard Driver for NetWare 4.x

Note: Netware 4.1 requires two patches to enable the ODI 3.3 support. Download the server patch *410pt7.exe* and the NLM patch *landr9.exe* from http://support.novell.com. ODI 3.3 patches are not required for Netware 4.11.

Using the INETCFG utility

INETCFG.NLM is the recommended utility to properly install and configure the Netware driver.

Before installing the Netware driver, delete all previously installed adapters.Remove all load and bind commands relating to the

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EMPCI driver from the *autoexec.ncf* as well as the *sys:etc\failover.ncf*, if this file exists.

1. At the console prompt type load inetcfg and press **Enter**.
2. Click **Yes** to transfer all commands from *autoexec.ncf*.
3. From the main menu, select **Boards** and press **Enter**. A list of network adapters appears.
4. Press **Ins** to add a new driver. A list of available LAN drivers appears.
5. Press **Ins** again and install the driver from the Netware driver diskette. Specify the correct path to the new *empci.lan* (for example, a:\nwserver\empci.lan).
6. Select the new empci from the updated list.
7. Type in a name for the newly added adapter.
8. Specify the index number in the next field (1 is the default for the first board; set the next board at 2, and so forth).
9. Specify Half or Full Duplex mode.
10. Press **Esc** and save the configuration.
11. From the INETCFG main menu, select **PROTOCOLS**. Select the appropriate protocols for your network.
12. Press **Esc** to exit, saving your protocol configuration.
13. From the INETCFG main menu, select **BINDINGS**. Highlight the protocol to bind and press **Ins**. Repeat this step until all bindings are complete. Repeat this step for any additional adapters in the system.
14. Press **Esc** and save your configuration as you exit. Press **Esc** again to exit the INETCFG utility.
15. At the server console type down and then type restart system to start the new configuration.

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Installing the Duralink Driver for NetWare 4.x

Caution: Do not combine installation methods; this can corrupt the system.To switch to a different method, first remove all installed adapters, then begin the installation process again.

Note: Netware 4.1 requires two patches to enable the ODI 3.3 support. Download the server patch 410pt7.exe and the NLM patch *landr9.exe* from http://support.novell.com. ODI 3.3 patches are not required for Netware 4.11.

Using the INETCFG utility

To install and configure LAN drivers you must use the INETCFG utility. Before you load INETCFG, make sure that there are no Load EMPCI Driver commands in *autoexec.ncf*.

1. Make sure no EMPCI LAN driver commands are loaded in *autoexec.ncf*
2. At the console prompt type load inetcfg and press **Enter**.
3. Click **Yes** to transfer all commands from *autoexec.ncf*.
4. From the main menu select BOARDS and press **Enter**. A list of network adapters appears. Press **Ins** to insert a new board. A list of available drivers appears. Press **Ins** to install the new driver. Specify the path to the new *empci.lan*. The INETCFG utility copies the file to the \System directory and take you back to the LAN driver list. Select **EMCPI** from the list.
5. At the prompt, specify a name for the adapter.
6. Press **Enter** and select the type of adapter (primary, backup or stand-alone).
7. Specify the INDEX number in the next field (1 is the default for the first board; set the next board at 2 and so forth.)
8. Select **HALF DUPLEX** or **FULL DUPLEX** mode

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Note: When configuring the primary adapter in failover mode, provide the index number for the backup adapter. When configuring the backup adapter, provide the index number for the primary board.

9. Press **Esc** and save the configuration.
10. To configure the backup board, repeat steps 4-9.
11. Confirm that the two boards are installed and configured, then select **PROTOCOLS** from the main menu and make sure that your network protocols are enabled. IPX/SPX is enabled by default.
12. When your protocols are enabled and configured (TCP/IP numbering scheme), select **Bindings** from the main menu.
13. Select **INSERT** and select the protocol to bind to the network adapter.
14. Repeat steps 11-13 for the second (Backup) adapter.
15. Highlight the backup adapter and press **Tab** to disable it. This insures proper Failover operation and traffic routing.
16. View CONFIGURATION to make sure that the boards are installed and configured properly.
17. Press **Esc** and exit the INETCFG utility.
18. At the server console type down and then type restart system to start the new configuration. Initial configuration of the driver is complete.

Enabling SNMP Agents

1. Add the following two lines at the end of the sys:system/autoexec.ncf file.

   - LOAD CDTDMI
   - LOAD FAILMIB

   The installation and initial configuration of the driver is complete.
2. Reboot for the configuration to take effect.

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Manual Installation

For manual driver installation

1. Make sure that the system is clean.
   - Type load forcnfg to remove the adapters.
   - Load the INETCFG utility to delete all EMPCI boards.
   - Remove all load and bind commands related to EMPCI from the *sys:system\autoexec.ncf* as well as the *sys:etc\failover.ncf* line in the *autoexec.ncf* file.
2. Copy these files, empci.ldi, empci.lan, cdtdim.lan, failmib.lan to the *sys:system* directory of the NetWare server from the installation diskette to the *sys:system* directory of the NetWare Server.
3. Edit the *autoexec.ncf* file manually, including the correct load and bind commands. A sample set of load and bind commands follows.
   - Load command for TCP / IP protocol (not needed if TCP / IP is not used)

     ```
     LOAD TCPIP
     ```

   - Load command for PRIMARY; B_INDEX indicates Backup INDEX Number.

     ```
     LOAD EMPCI NAME=PRIMARY_E82
     FRAME=ETHERNET_802.2 INDEX=1 B_INDEX=2
     ```

   - Load command for BACKUP; P_INDEX indicates primary INDEX Number.

     ```
     LOAD EMPCI NAME=BACKUP_E82 FRAME=ETHERNET_802.2
     INDEX=2 P_INDEX=1
     ```

   - Bind command for PRIMARY, there is no bind command for BACKUP.

     ```
     BIND IPX PRIMARY_E82 NET=101
     ```

   - Load command for DMI agent (except FAILOVER)

     ```
     LOAD CDTDMI
     ```


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- Load command for Failover DMI agent

  LOAD FAILMIB

4. Reboot for the configuration to take effect.

You must manually edit the load and bind commands to configure or deconfigure the system.

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DOS ODI

Note: Consult the *\readme\dosodi.txt* file for the latest driver information and installation instructions. Some procedures or information may have changed or may not have been available when this user's guide was printed.

The following is a partial list of products supported by the DOS ODI driver:

- Novell NetWare 286 Client
- Novell NetWare 3.1x Client
- NetWare 4.x DOS Requester (VLM)
- Novell Personal NetWare
- Novell LAN WorkPlace for DOS
- Windows for Workgroups

The DOS ODI driver is compatible with DOS memory managers such as EMM386 and can be loaded into high memory. In addition, the driver is compatible with Windows 3.0 and later.

Automated NetWare Client Installation

If you are using the VLM DOS Requester, you can run the automated NetWare Client Install that comes with NetWare 3.x:

1. Run *Install* from your Novell client install diskette.
2. At Step 4 during the install process, remove the Novell client install diskette and insert your Adaptec diskette, specifying *\dosodi* as the directory location for your adapter driver.

Manual Installation

To install the DOS ODI driver manually, follow these instructions:

1. Insert the Adaptec setup diskette into drive *A*.
2. Copy the *\dosodi* directory on the Adaptec setup diskette into your workstation's NetWare directory (usually called *\nwclient*)

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3 Edit your *net.cfg* file using a text editor. Add the following lines:

```
LINK DRIVER EMPCI
 Frame Ethernet_802.2
 Protocol IPX E0 Ethernet_802.2
```

Your *autoexec.bat* should contain the following lines:

```
LSL.COM
EMPCI.COM
IPXODI.EXE
VLM.EXE
```

If you are using the VLM, you should add the following line to your *config.sys*:

```
LASTDRIVE=Z
```

DOS ODI Parameters

See *\readme\dosodi.txt* for supplemental installation instructions and descriptions of keyword parameters.

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Windows NT 4.0

Note: Consult the *\readme\nt351std.txt, \readme\nt351dur.txt, \readme\nt40std.txt,* or *\readme\nt40dur.txt* files for the latest driver information and installation instructions. Some procedures or information may have changed or may not have been available when this user's guide was printed.

The Windows NT 4.0 driver is in the *\winnt\386* directory. To install the Windows NT 4.0 driver for the ANA-6944/TX, your computer must support PCI-to-PCI bridge chips. See Chapter 2, *Installing Your Adapter*, for information on how to determine if your computer supports PCI-to-PCI bridge chips.

Note: These instructions are for Windows NT 4.0 only. To install drivers for Windows 3.51, see the *\readme\nt351std.txt* file.

Installing the Standard Driver for Windows NT 4.0

Note: These instructions apply to standard drivers only. If your adapter shipped with Duralink software, see *Installing the Duralink Driver for Windows NT 4.0* on page 4-14 or refer to the *readme\nt40dur.txt* file.

1. Place an Adaptec PCI adapter (such as ANA-6911A/TX) in the system.
2. Boot your system with Windows NT 4.0.
3. Double-click the **My Computer** icon.
4. Double-click the **Control Panel** icon.
5. Double-click the **Network** icon.

Note: If no drivers are currently installed for Adaptec or Cogent PCI adapters, skip to step 13.

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Remove Existing Adaptec Ethernet Drivers

6 Click the **Adapters** tab in the Network Setup dialog box.

7 To remove any currently installed Adaptec or Cogent PCI adapters highlighting the adapter, click **Remove,** then click **OK**. Repeat until all Adaptec or Cogent PCI adapter drivers are removed.

8 Click **Close** to close the **Network** dialog box.

9 Click **Yes** to restart your computer.

Note: When you restart Windows NT, a message may indicate that at least one service failed to start. This message will not appear after you add the new Duralink drivers in the following steps. Click **OK**.

Adding Standard Drivers

10 Double-click the **My Computer** icon.

11 Double-click the **Control Panel** icon.

12 Double-click the **Network** icon.

13 Click the **Adapters** tab in the Network dialog box.

Note: Do not allow Network setup to autodetect the network adapter.

14 Click **Add**.

15 Click **Have Disk**.

16 At the prompt **Insert disk with software provided by the software or hardware manufacturer**, insert the disk with the Windows NT driver. Enter the path to the directory where the driver and OEMSETUP file are located. Click **OK**.

17 Select the OEM Option dialog box. Select the adapter type (for example, 6911, 6911A, 6944A, and so forth) or Adaptec PCI Ethernet adapter. Click **OK**.

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Configuring the Drivers

18 From the Driver Configuration dialog box, choose the appropriate connection type for your network. Use the default selection, Autodetect Default Connection, if you don't know the appropriate connection type. The options are:

- Autodetect Default Connection

  Detects the cable type and optimal line speed for the specific Adaptec PCI adapter model in use. This is the default and recommended connection type. refer to the NT Help file in the Adapter Configuration dialog box for the specific default settings for an adapter.

- InitSense / Half Duplex

  Detects the line speed (10 or 100 Mb / s) when the adapter initializes and is set for Half Duplex mode.

- InitSense / Full Duplex

  Detects the line speed (10 or 100 Mb / s) when the adapter initializes and is set for Full Duplex mode.

- ActiveSense / Half Duplex

  Detects the line speed (10 or 100 Mb / s) when the adapter initializes and continues to check for change in the line speed.The adapter is configured for Half Duplex mode.

- ActiveSense / Full Duplex

  Detects the line speed (10 or 100 Mb / s) when the adapter initializes and checks for change in the line speed. The adapter is configured for Full Duplex mode.

- 10 Mb / s UTP / Half Duplex

  Forces the connection to 10 Mb / s in Half Duplex mode.

- 10 Mb / s UTP / Full Duplex

  Forces the connection to 10 Mb / s in Full Duplex mode.

- 100 Mb / s / Half Duplex

  Forces the connection to 100 Mb / s in Half Duplex mode.

- 100 Mb / s / Full Duplex

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Forces the connection to 100 Mb/s in Full Duplex mode.

- THIN

  Use this when connecting to the BNC port of a Combo adapter. This is a 10 Mb/s Half Duplex only connection.

- THICK

  Used for an adapter that uses an AUI port.This is a 10-Mb/s Half Duplex only connection.

Note: Be sure to select the appropriate cable type for your network.

Click **Continue**.

19 Repeat step 18 for each Adaptec adapter installed in your system. Each adapter can be identified by its unique PCI Bus/PCI Slot number.

20 If SNMP has not been set up on this computer you will receive the following setup Message: **Install the NT SNMP service and use configure option to configure Server related MIBs**. Click **OK**.

Installing the Duralink Driver for Windows NT 4.0

1 Place at least two Adaptec PCI adapters (such as ANA-6911A/TX) in the system.

Note: To avoid conflicts on the network, do not attach cables from both adapters to a common hub until after the drivers have been configured for failover and the system has rebooted.

2 Boot your system with Windows NT 4.0.

3 Double-click the **My Computer** icon.

4 Double-click the **Control Panel** icon.

5 Double-click the **Network** icon.

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Note: If no drivers are currently installed for Adaptec or Cogent PCI adapters, skip to step 13.

Remove Existing Adaptec Ethernet Drivers

6. Click the **Adapters** tab in the Network dialog box.
7. To remove any currently installed Adaptec or Cogent PCI adapters highlighting the adapter, click **Remove,** then click on **OK**. Repeat until all Adaptec or Cogent PCI adapter drivers are removed.
8. Click **Close** to close the **Network** dialog box.
9. Click **Yes** to restart your computer.

Note: When you restart Windows NT, a message may indicate that at least one service failed to start. This message will not appear after you add the new Duralink drivers in the following steps. Click **OK**.

Adding Duralink Drivers

10. Double-click the **My Computer** icon.
11. Double-click the **Control Panel** icon.
12. Double-click the **Network Setup** icon.
13. Click the **Adapters** tab in the **Network Setup** dialog box.

Note: Do not allow Network Setup to autodetect the network adapter.

14. Click **Add**.
15. Click **Have Disk**.
16. At the prompt **Insert disk with software provided by the software or hardware manufacturer,** insert the disk with the Duralink failover driver. Enter the path to the directory where the driver and OEMSETUP file are located. Click **OK**.

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Configuring the Drivers

17 From the Duralink Setup by Adaptec dialog box, choose the appropriate connection type for your network. Use the default selection, Autodetect Default Connection, if you don't know the appropriate connection type. The options are:

- Autodetect Default Connection

  Detects the cable type and optimal line speed for the specific Adaptec PCI adapter model in use. This is the default and recommended connection type. refer to the NT Help file in the Adapter Configuration dialog box for the specific default settings for an adapter.

- InitSense / Half Duplex

  Detects the line speed (10 or 100 Mb / s) when the adapter initializes and is set for Half Duplex mode.

- InitSense / Full Duplex

  Detects the line speed (10 or 100 Mb / s) when the adapter initializes and is set for Full Duplex mode.

- ActiveSense / Half Duplex

  Detects the line speed (10 or 100 Mb / s) when the adapter initializes and continues to check for change in the line speed.The adapter is configured for Half Duplex mode.

- ActiveSense / Full Duplex

  Detects the line speed (10 or 100 Mb / s) when the adapter initializes and checks for change in the line speed. The adapter is configured for Full Duplex mode.

- 10 Mb / s UTP / Half Duplex

  Forces the connection to 10 Mb / s in Half Duplex mode.

- 10 Mb / s UTP / Full Duplex

  Forces the connection to 10 Mb / s in Full Duplex mode.

- 100 Mb / s / Half Duplex

  Forces the connection to 100 Mb / s in Half Duplex mode.

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- 100 Mb/s/Full Duplex

  Forces the connection to 100 Mb/s in Full Duplex mode.

- THIN

  Use this when connecting to the BNC port of a Combo adapter. This is a 10 Mb/s Half Duplex only connection.

- THICK

  Used for an adapter that uses an AUI port.This is a 10-Mb/s Half Duplex only connection.

Note: Be sure to select the appropriate cable type for your network. Also, be sure that both failover ports have been configured to use the same connection type.

Click **Continue**.

18 Repeat step 17 for each Adaptec adapter installed in your system. Each adapter can be identified by its unique PCI Bus/PCI Slot number.

19 If SNMP has not been set up on this computer you will receive the following Setup Message: **Install the NT SNMP service and use configure option to configure Server related MIBs**. Click **OK**.

Configuring the Primary and Backup Ports

20 Highlight the Adaptec adapter that you want as a primary adapter. Click **Properties**.

21 In the Failover section in the Duralink Setup by Adaptec dialog box, click **Configuration**.

22 In the Available Backup Ports section in the Duralink Failover Manager dialog box, highlight the adapter you want as a backup and click **Add**.

23 The Link Check Timeout value is the number of seconds that elapse between Duralink's checks for failure of the active link. You can change this value or leave the default at 10.

24 Click **OK** to close the Duralink Failover Manager.

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25 Click **Continue**. The Duralink Setup by Adaptec dialog box appears.

26 If SNMP has not been set up on this computer you will receive the following Setup Message: **Install the NT SNMP service and use configure option to configure Server related MIBs**. Click **OK**.

27 Click **Close** to close the **Network** dialog box. The protocol and service binding information for the primary and backup ports will be written.

28 Remove any floppy disks and click **Yes** to restart your computer now.

Note: You can now attach cables from both adapters to a common hub.

SNMP Management Station

The following MIB files must be compiled on the SNMP Management station to manage the ANA-6911:

- ADPTDMI.MIB - Adaptec Ethernet DMI/SNMP MIB
- FAILOVER.MIB - Adaptec Duralink Failover MIB

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Windows 95

Note: Consult the *\readme\win95.txt* file for the latest driver information and installation instructions. Some procedures or information may have changed or may not have been available when this user's guide was printed.

The Windows 95 driver is in the *\win95* directory.

Windows 95 Installation for PCI

1. Power OFF your system and install your Adaptec PCI adapter in any bus mastering PCI slot.
2. After booting up Windows 95, the operating system detects any newly installed adapter, and requests that the driver diskette be inserted.
3. Put the diskette in drive *A* and specify a:\win95 as the path to the driver.
4. During the driver installation process, Windows 95 also requests the WIN95 CD-ROM or diskette so that configuration files can be copied from it.
5. Make sure that at least one network client and one protocol are installed, in addition to the Adaptec adapter driver now listed under Control Panel / Network.
6. To configure any of the parameters on the Adaptec adapter, highlight the adapter in the list of installed drivers and select **Properties**.
7. After you have made all changes, Windows 95 will restart your system.

Windows 95 Driver Parameters

Connection Type — To enable Full Duplex on PCI adapters only, select any one of InitSense/Full Duplex, ActiveSense/Full Duplex, 10 Mb/s UTP/Full Duplex, or 100 Mb/s UTP/Full Duplex (TX only). Requires connection to a switch or other device supporting Full Duplex.

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Windows for Workgroups

Note: Consult the *\readme\wfw.txt* file for the latest driver information and installation instructions. Some procedures or information may have changed or may not have been available when this user's guide was printed.

The Windows for Workgroups **.386* file supports all Adaptec PCI single port adapters.

You can use any of the following drivers for Windows for Workgroups:

- DOS ODI (*empci.com*)
- DOS NDIS 2.0 (*empci.dos*)
- Windows 32-bit NDIS 3.0 (*empci.386*)

The *oemsetup* file located in the *\windows* subdirectory supports installation and configuration of any of these three drivers.

1. In the **Main** program group, double-click the **Windows Setup** icon.
2. From the Options menu, select **Change Network Settings**.
3. From the Network Setup dialog box, click the **Drivers** button.
4. Click the **Add Adapter** button.
5. From the list of adapters provided, select **Unlisted** or **Updated Network Adapter**.
6. Select the drive where your Adaptec driver diskette is located and select the *\windows* subdirectory as the install path. Click **OK**.
7. Select your Adaptec PCI adapter from the list of adapters provided, then click **OK**. You can use the NDIS 3.0 (32-bit), the DOS ODI, or the DOS NDIS driver.
8. After clicking **OK**, you can highlight your Adaptec adapter in the list of network drivers, and then select setup, to edit the network adapter settings.

   For the non-NDIS 3.0 drivers, use this setup option to select between DOS ODI and DOS NDIS. The Driver Type option at

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the bottom of the Setup window allows you to choose between NDIS and ODI.

9 After making any driver setup changes, select **Close** to go back to the previous window. Click **OK** again to exit from the Network Driver Install window. At this point, any necessary drivers will be copied to your system from the Windows for Workgroups and Adaptec diskettes.

10 You must reboot before your new driver takes effect.

Windows for Workgroups Driver Parameters

See *\readme\wfw.txt* for supplemental installation instructions and descriptions of additional NDIS 3.0 keyword parameters.

See *\readme\ndis.txt* for supplemental installation instructions and descriptions of additional NDIS 2.0 keyword parameters.

See *\readme\dosodi.txt* for supplemental installation instructions and descriptions of additional DOS ODI keyword parameters.

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NDIS 2.0

Note: Consult the *\readme\ndis.txt* file for the latest driver information and installation instructions. Some procedures or information may have changed or may not have been available when this user's guide was printed.

The NDIS 2.0 driver for DOS is in the *\ndis.dos* directory. The NDIS 2.0 driver for OS/2 is in the *\ndis.os2* directory. The Microsoft LAN Manager installation file is in the *\mslanman.dos* directory tree.

Here is a partial list of products that use the NDIS driver:

- Microsoft LAN Manager
- Artisoft Lantastic
- IBM DOS LAN Requester
- IBM OS/2 Warp Connect
- DEC® PATHWORKS for DOS
- SunSoft PC-NFS
- Banyan® VINES Client
- Various brands of TCP/IP

The DOS NDIS driver is compatible with DOS memory managers such as *emm386* and can be loaded into high memory. In addition, the driver is compatible with Windows 3.0 and later. The NDIS 2.0 driver will also work with any other OS that complies with NDIS 2.0 specifications.

Installing With LAN Manager

Follow the instructions below to install the NDIS driver for LAN Manager, OS/2 Warp, and others.

1. Boot your system.
2. Run your network operating system's setup program according to the documentation provided with your network operating system software.
3. When prompted, insert the driver diskette in drive *A*.
4. Enter information as required.
5. Exit your network operating system's setup program.

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6 Reboot your computer.

For information about configuring multiple adapters, see *\readme\ndis.txt.*

Note: Your *protocol.ini* should include a section similar to the following:

```
[EMPCI_NIF]
DRIVERNAME=EMPCI$
```

NDIS Driver Parameters

See *\readme\ndis.txt* and *\readme\os2.txt* for a complete list of parameters, supplemental installation instructions, and descriptions of additional *protocol.ini* keyword parameters.

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IBM OS/2 SMP

Note: Consult the *\readme\os2.txt* file for the latest driver information and installation instructions. Some procedures or information may have changed or may not have been available when this user's guide was printed.

The ANA-6944A/TX, ANA-6901, and the ANA-6911A/TX OS/2 drivers support OS/2 SMP. If you choose to run an older or different version of OS/2, you may need to obtain your protocol or client files from third-party sources.

The ANA-6944A/TX, ANA-6901A, and the ANA-6911A/TX OS/2 drivers support connections to all of the following network operating systems:

- Novell NetWare
- OS/2 Peer Client
- IBM LAN Server
- IBM LAN Requestor
- Windows NT

Follow the instructions below to install the ANA-6944A/TX, ANA-6901, and the ANA-6911A/TX OS/2 drivers using OS/2 SMP. If you are using an older version of OS/2, refer to the installation documentation that came with your OS/2 software.

Installing with LAN Server

Use this installation procedure when installing for the IBM LAN Server and IBM LAN Requestor environments.

1. In the IBM LAN Services window, double-click the **OS/2 LAN Services Installation/Configuration** icon.
2. Select **Other Adapter** to add a single port adapter. Repeat this three times for the ANA-6944A/TX to add the other three ports as separate devices.
3. Enter the full path name for the drivers as follows:

   a:\ndis.os2

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The drivers are now displayed on the list of drivers.

4 Click **Add** to add the drivers.

Note: If you added all four ports for the ANA-6944A/TX, OS/2 automatically loads as many drivers as you need when you reboot.

5 Select the appropriate protocols and click **Add**.

Note: If you need to configure each port with different protocols, pay attention to the order of binding. The first device on your list installs the driver for port 1 (the top connector on the card and the furthest from the PCI bus connector). The second device loads port 2 (next to port 1), and so on.

6 Shutdown OS/2 and reboot for your network driver and protocol(s) to take effect.

Installing the Drivers for a Pre-existing OS/2 SMP

Use the following instructions if you already have OS/2 SMP or OS/2 Peer Client installed on your machine. If you are installing OS/2 SMP for the first time, see *Installing OS/2 SMP for the First Time* on page 4-26.

1 On your desktop, double-click the **MPTS** (Multi-Protocol Transport Services) icon.

2 Select **Install**.

3 Select **Install Additional Network Drivers**, and specify a:\ndis.os2 as the source. Select **OK**.

4 After the OS/2 driver is copied from the diskette, select **OK**.

5 Select **Configure**.

6 Select **LAN Adapters and Protocols** and then click **Configure**.

7 In the LAPS dialog box, under Network Adapters, highlight the **ANA-6944A/TX** and click **Add**. Repeat this three times to add the other three ports as separate devices.

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8 Under Protocols, highlight the desired network protocol(s) and click **Add**.

9 Click **Edit** to change the ANA-6944A/TX configuration settings, if desired.

If you selected IBM NetWare Requester Support from the Protocols box, you need to make the following configuration changes:

- In the Current Configuration box, highlight **IBM NetWare Requester** and select **Edit**.
- Change the Token-Ring Support Option to **NO**.
- Enable one more of the listed Ethernet frame types by specifying **YES** in the appropriate boxes. (If you are not sure which frame type(s) are used on your NetWare network, enable all of them).
- Change the Network Adapter Address to the Ethernet address of your Adaptec adapter.

You can run *emdiag.exe* from your Adaptec driver diskette at an OS/2 command line prompt, and choose **Configuration Status**, to display your adapter's Ethernet address.

10 Make the changes and click **OK**.

11 In the Configure dialog box, select **Close**.

12 In the Multi-Protocol Transport Services dialog box, select **Exit**.

13 Select **Update CONFIG.SYS** and then select **Exit**.

14 Shut down OS/2 and reboot for your network driver and protocol(s) to take effect.

Installing OS/2 SMP for the First Time

Follow these instructions if you are installing OS/2 SMP or OS/2 Peer client for the first time.

1 Follow the general installation instructions provided with OS/2 SMP to begin your installation.

2 During the installation, specify the type(s) of networks you are using.

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3. Specify the type of network adapter you are using, select **Choose Other Adapter**.
4. Enter the source for the Network Adapter Driver Disk as follows:

   a:\ndis.os2

5. Select **OK**.
6. OS/2 displays a Drivers Found message to confirm your choice.
7. Specify **Ethernet** as the type of LAN and select **OK**.
8. Select **OK** twice more to confirm your choice.
9. Continue through the rest of the OS/2 installation, following the on-screen instructions.

Editing Driver Parameters

See *\readme\ndis.txt* for complete information about driver parameters.

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UNIX Drivers

The Adaptec adapters support the following UNIX products (support for some UNIX versions not available on every adapter):

- SCO UNIX System 3.2 v4.2
- SCO Open Desktop 3.0/5.0
- SCO OpenServer 5.0 (ANA-6911A/TX, ANA-6901, and ANA-6944A/TX only)
- SCO Unixware SMP (ANA-6911A/TX, ANA-6901, and ANA-6944A/TX only)
- Sun Solaris 2.4/2.5
- NextStep 3.2/3.3

The list of supported UNIX systems is updated periodically; contact Adaptec if your type of UNIX is not listed here. The UNIX drivers and installation instructions are available from Adaptec's BBS, CompuServe Forum, World Wide Web, and FTP sites.

The Sun Solaris and NextStep drivers are available at the World Wide Web sites of the respective operating system vendors. See the appropriate *\readme.txt* file for your UNIX operating system.

SCO OpenServer 5.0

The ANA-6944A/TX, ANA-6901A, and the ANA-6911A/TX UNIX drivers support SCO OpenServer 5.0.

Installing the SCO OpenServer Driver

1. Insert the Unix Drivers diskette into the first floppy drive (usually *A*).
2. Make a directory for the driver, as follows:

   ```
   mkdir adaptec
   ```

3. Change to the directory you just created, as follows:

   ```
   chdir adaptec
   ```

4. Copy the files from the floppy diskette to the hard disk, as follows:

   ```
   doscp a:\sco5_0\*.*.
   ```


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5 Extract the driver files, as follows:

```
tar -xvf -d adaptec\empci.tar
```

6 Enter the Software Manager window, as follows:

```
custom
```

7 On the Software menu, select **Install new**.

8 Select the host (computer) you want to install from, and click **Continue**. The default host is the computer on which you are working.

9 In the Select Media dialog box select **media images** and click **Continue**.

10 Enter the directory path for the directory containing the media images (*/adaptec*), and click **OK**.

11 Select **Full installation**, and click **OK**.

The program displays the progress of the installation, and displays a message box telling you when you are finished. If the installation was successful, the driver name will be listed in the Software Manager window.

Configuring the SCO OpenServer Driver

Once the driver is installed, you can configure the driver for the ANA-6911A/TX, ANA-6901, or the ANA-6944A/TX.

1 In the System Administration window, double-click the **Networks** icon.

2 Open the Network Configuration Manager.

3 On the Hardware menu, select **Modify Hardware Configuration**.

4 Make the necessary changes in the Network Driver Configuration window, and select **OK**.

5 On the Hardware menu, select **Exit**.

6 Relink, and reboot the system.

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SCO Unixware SMP

The ANA-6944A/TX, ANA-6901A, and the ANA-6911A/TX UNIX drivers support SCO

Installing the Drivers

1. Insert the Unix Drivers diskette into the first floppy drive (usually *A*).
2. Make a directory for the driver, as follows:

   mkdir adaptec
3. Change to the directory you just created, as follows:

   chdir adaptec
4. Copy the files from the floppy diskette to the hard disk, as follows:

   doscp a:\unixware*.*.
5. Extract the files, as follows:

   tar -xvf -d adaptec\empci.tar
6. To install the drivers, type:

   ./Install

   The system loads the *EMPCI* modules and displays the following messages:

   ADAPTEC: Adaptec (10/100) PCI Fast Ethernet Installation

   ADAPTEC: Please Enter the Card you are Installing (1/2)

   1. Adaptec ANA-6911A PCI EM110

   2. Adaptec ANA-6944A PCI EM4400
7. Enter the number (1 or 2, as shown above) of the adapter you are installing. The system displays the following messages:

   ADAPTEC: Netinfo

   EMPCI_0

   EMPCI_1

   EMPCI_2

   EMPCI_3

   ADAPTEC: Please use /etc/confnet.d/configure -i to configure the IP address

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ADAPTEC: Installation Complete

ADAPTEC: Please Reboot the system for the changes to take effect.

Note: The system lists an EMPCI address for each of the ANA-6944A/TX ports.

8 Reboot the system.

Configuring the IP Addresses

1 To begin configuring the IP Addresses for the ANA-6944A/TX, enter:

```
/etc/confnet.d/configure -i
```

The system lists the devices and displays the following message:

These are the devices available on your system:

1 EMPCI_0

2 EMPCI_1

3 EMPCI_2

4 EMPCI_3

Type the number of the device(s) to be configured with inet [?,??,quit]:

2 For the ANA-6944A/TX, enter the four addresses, using spaces in between the numbers (no commas):

```
1 2 3 4
```

The system displays the following message:

Please enter the IP host name for device EMPCI_0 (default: xxx):

3 Enter the name of the host (string). The system displays the following message:

Please initialize the IP address for the host xxx (default: xxx.xx.xx.xx):

4 Enter the IP address, or press **Enter** to use the default IP address. The system displays the following message:

Configure host xxx with the default Ethernet (TM) if config options?: (yes no ClassC BerkeleyC info; default:info):

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5 Enter *Class C* for ClassC type addressing. The system displays the following message:

Do you want to set this machine as a gateway?[y/no/ unchanged]

6 Enter *y, n* or *u* (if unsure). Please refer to your system administrator about gateways.

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Using EMDIAG to Troubleshoot Problems

Note: Consult the *\readme\emdiag.txt* file for the latest information and instructions. Some procedures or information may have changed or may not have been available when this user's guide was printed.

This chapter explains how to use the Adaptec *EMDIAG* program, and how to troubleshoot problems that you may be having with your adapter.

If your adapter is not functioning properly, first make sure that it was set up according to instructions in this document.

1. Verify that your adapter is installed properly and configured correctly (Chapter 2, *Installing Your Adapter*).
2. Verify that your network is properly cabled and the adapter is properly connected (Chapter 3, *Connecting to Your Network Cable*).
3. Verify that the adapter's network driver is installed correctly (Chapter 4, *Installing Network Drivers*).
4. Verify that you are using the latest BIOS for your computer, and the latest driver for your adapter.

If the adapter still does not work, run the adapter's diagnostic tests.

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Running EMDIAG

Your Adaptec adapter is supplied with a comprehensive diagnostics program called *emdiag.exe*. *EMDIAG* resides in the root directory of the Adaptec diskette. To run *EMDIAG*

1. Boot up to MS-DOS version 3.3 or later. You should run *EMDIAG* with no network drivers loaded.
2. Type A:\EMDIAG and press **Enter** to start *EMDIAG.*

Using EMDIAG for PCI Adapters

EMDIAG for PCI adapters includes a number of startup options. These startup options allow you to specify a particular Adaptec adapter if you have more than one Adaptec adapter installed in your computer, and to override *EMDIAG's* default configuration settings.

The optional startup parameters for *EMDIAG* are:

/t: [value]	Determines the number of times (in thousands) the transmitter test is run, when local or remote diagnostics is initiated.
/v: [10 or 100]	Overrides cable speed AutoSensing and sets the signalling speed to be used by *EMDIAG* to either 10 Mbps or 100 Mbps.
/x: [thin or utp]	Overrides connector AutoSensing and sets the connector to be tested by *EMDIAG*

EMDIAG PCI Main Menu

There are six menu options on the EMDIAG PCI Main Menu:

- Configuration Status
- Diagnostics
- PCI Device Information
- Readme Viewer
- Technical Support Information
- Exit

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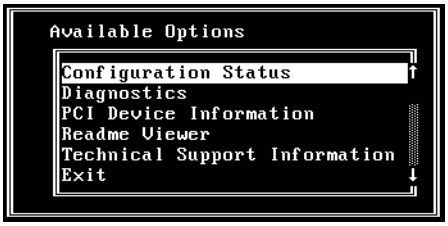
The menu options permit you to view the configuration and device information, run diagnostics, access technical support and Readme files, and leave the *EMDIAG* program.



When you quit *EMDIAG*, you can access the *cogent.log* or *adaptec.log* in your directory. This is an ASCII text file contains BIOS configuration information generated by *EMDIAG*. This information can be used by Technical Support to help diagnose problems.

Configuration Status

When you select the Configuration Status option on the Main Menu, the Current Configuration screen appears. The Current Configuration screen shows the resources in use by the adapter. Use this option to determine if your adapter is recognized by the system.

Note: If Configuration Status reports that no Adaptec adapter is found, your adapter is not yet ready for use. Make sure that your PCI BIOS is assigning resources to the PCI slot of the adapter and that the adapter is in a bus mastering slot.

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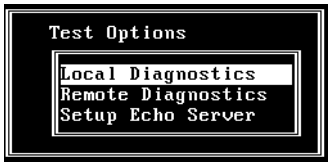
Diagnostics

When you select **Diagnostics** on the Main Menu, The Test Options menu appears. You may select to run **Local Diagnostics**, **Remote Diagnostics**, or **Setup Echo Server**. These test options are described below:



- **Local Diagnostics** tests whether your adapter's components, including the transceiver and Ethernet controller, are working properly. To test your adapter locally, run the diagnostics on an Adaptec adapter installed in a computer connected to a network or terminated cable.
- **Remote Diagnostics** tests how accurately your Adaptec adapter sends packets to and receives packets from an echo server. To test your adapter with a test workstation and an echo server, make sure that both the workstation and echo server are on a private network and each contain an Adaptec adapter. To achieve valid results, use an adapter in the echo server which is known to function correctly.
- **Setup Echo Server** sets up the workstation to act as an echo station for another Adaptec workstation running the **Remote Diagnostics** option. Make sure that the workstation in use as the echo server is known to work properly.

Running Local Diagnostics

If you select Local Diagnostics from the Test Options menu, the screen displays a list of tests to be run. The tests are: Controller Integrity, Time Domain Reflectometer, Loopback, and Transmitter.

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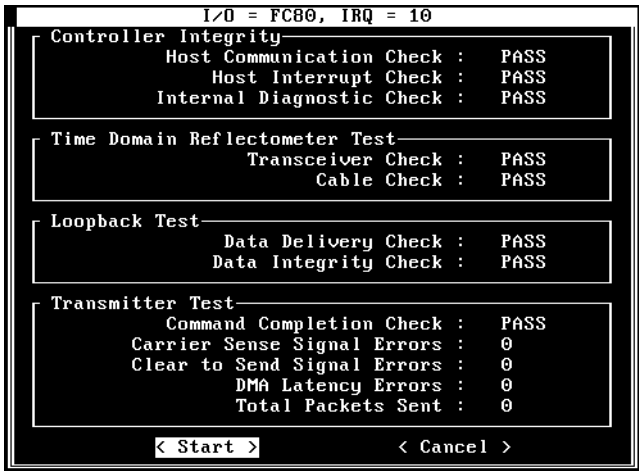
Press **Tab** to select the **Start** button and then press **Enter** to begin the local diagnostics tests. As each test finishes, the completion status is displayed.


I/O = FC80, IRQ = 10
Controller Integrity
Host Communication Check : PASS
Host Interrupt Check : PASS
Internal Diagnostic Check : PASS
Time Domain Reflectometer Test
Transceiver Check : PASS
Cable Check : PASS
Loopback Test
Data Delivery Check : PASS
Data Integrity Check : PASS
Transmitter Test
Command Completion Check : PASS
Carrier Sense Signal Errors : 0
Clear to Send Signal Errors : 0
DMA Latency Errors : 0
Total Packets Sent : 0
< Start >
< Cancel >

Running Remote Diagnostics

Before running Remote Diagnostics, you must first set up an echo server on another Adaptec adapter.

After selecting Remote Diagnostics from the Test Options menu, the screen displays a list of tests it will run. The tests are: Remote Loopback, Transmitter Section Statistics, and Receiver Section Statistics.

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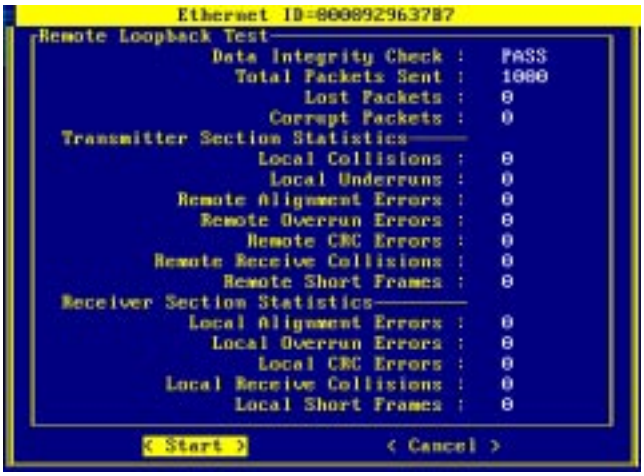
Press **Tab** key to select **Start** to begin the remote diagnostic tests. As each test finishes, the completion status is displayed.


Ethernet ID=000892963787
Remote Loopback Test
Data Integrity Check : PASS
Total Packets Sent : 1000
Lost Packets : 0
Corrupt Packets : 0
Transmitter Section Statistics
Local Collisions : 0
Local Underruns : 0
Remote Alignment Errors : 0
Remote Overrun Errors : 0
Remote CRC Errors : 0
Remote Receive Collisions : 0
Remote Short Frames : 0
Receiver Section Statistics
Local Alignment Errors : 0
Local Overrun Errors : 0
Local CRC Errors : 0
Local Receive Collisions : 0
Local Short Frames : 0
< Start >
< Cancel >

Setting up the Echo Server

A workstation using the Setup Echo Server option from the Test Options menu works in conjunction with another workstation running the Remote Diagnostics option. The workstation waits to receive any echo packets being sent by a remote workstation running the Remote Diagnostics option and using any Adaptec LAN adapter.

The echo server workstation waits to receive echo packets from the remote workstation. The Echo Server screen reports the number of packets reflected.

PCI Device Information

The PCI Device Information option on the Main Menu provides information about all PCI devices installed in the computer, including Adaptec LAN adapters. The information displayed

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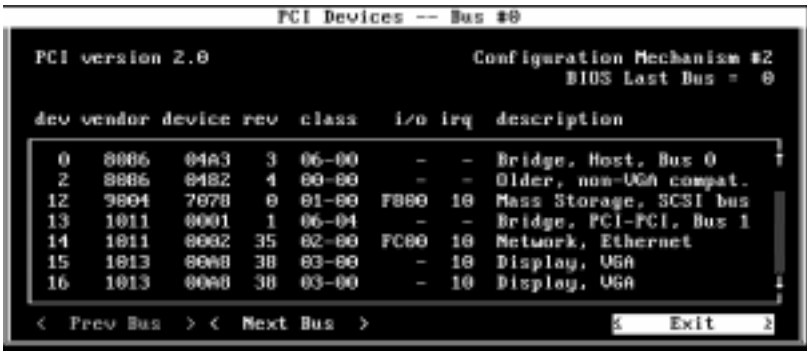
includes slot (or device) number, vendor ID, interrupt (IRQ), I/O address, and description:


PCI Devices -- Bus #0
PCI version 2.0
Configuration Mechanism #2
BIOS Last Bus = 0
dev vendor device rev class i/o irq description
0 8086 04A3 3 06-00 - - Bridge, Host, Bus 0
2 8086 0482 4 00-00 - - Older, non-VGA compat.
12 9004 7078 0 01-00 F800 10 Mass Storage, SCSI bus
13 1011 0001 1 06-04 - - Bridge, PCI-PCI, Bus 1
14 1011 0002 35 02-00 FC00 10 Network, Ethernet
15 1013 00A8 30 03-00 - 10 Display, VGA
16 1013 00A8 30 03-00 - 10 Display, VGA
< Prev Bus > < Next Bus >
Exit

Quartet Device Information

If a Quartet adapter is installed, the PCI Device Information option helps you determine if your system's BIOS supports the PCI-to-PCI bridge chip, and allows you to view devices on a PCI bus that resides on the other side of a PCI-to-PCI bridge chip (including all four Fast Ethernet ports on a Quartet adapter).

- PCI-to-PCI bridge Chip Support—If your system does not support the PCI-to-PCI bridge chip, and you are using a Quartet adapter with Windows 95 or Windows NT, the system displays a warning message when you select the PCI Device Information option.

  For more information about PCI-to-PCI bridge chip support, see Chapter 2, *Installing Your Adapter*.

- Viewing PCI Bus Devices—To view devices on a PCI bus that resides on the other side of a PCI-to-PCI bridge chip, select the **NEXT BUS** option in the PCI Device Information window. You can also view all four Fast Ethernet ports on a Quartet adapter.

Note: PCI buses are numbered sequentially, starting with '0' for the first logical PCI Bus. Some motherboards have more than one PCI bus; the adapters and ports will be numbered depending on the bus they are on, and their position in the bus. The current bus number is displayed in the PCI Device Information windows title bar.

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Readme Viewer

This *EMDIAG* PCI Main Menu option allows you to view the *\readme.txt* file on-line. The file is located on the Adaptec diskette.

Technical Support Information

This *EMDIAG* PCI Main Menu option displays contact information for Adaptec Technical Support.

Exit

Choose this *EMDIAG* PCI Main Menu option to quit *EMDIAG*.

Troubleshooting

If your adapter fails the diagnostic tests, verify again that you have properly installed, configured, and cabled your adapter. Make sure that your cable, terminators, and connectors are functioning properly, or install the adapter in a different slot and run the diagnostic program again. See *Adaptec Technical Support and Services* on page ii if the solutions in this chapter do not help.

Isolating Faulty Hardware

If the problem persists, try the following:

- Replace the adapter with the same type of Adaptec adapter which is known to work. If the new adapter functions properly, the problem is related to the original adapter.
- Install the adapter in another functioning computer and run the tests again. If the adapter works in this machine, the problem is related to one of three areas:
  - The computer is faulty
  - There is a hardware conflict
  - There are problems with the cables or connectors

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Frequently Asked Questions

Use the following table to help answer common questions.

Symptom	Solution
EMDIAG reports that the PCI adapter is not found.	Make sure an interrupt is being allocated in the BIOS configuration. Make sure that you are using the latest BIOS available for your computer.
NetWare workstation cannot connect to server.	Make sure workstation and server are using the same frame type.
The Adaptec network adapter does not work with a PCI SCSI adapter installed.	Try moving the Adaptec network adapter to the lowest numbered PCI slot.
Network performance is extremely slow.	If you are using a TX adapter for 100 Mbps, be sure to use CAT 5 UTP. Is your adapter configured for Full Duplex? If so, make sure the switch is configured for Full Duplex.
Link status light does not light when connected to the cable.	Make sure the adapter's network driver is loaded.
System hangs upon boot up.	Determine if the problem is a memory conflict by booting again with no memory manager present. If the system now boots up, you may need to upgrade EMM386 (PCI systems).
EMDIAG reports that not all test packets are transmitted properly.	You are probably connected to an active network cable and are simply encountering collisions on the cable. If so, losing some packets is normal.
Quartet *EMDIAG* reports that the PCI BIOS does not support PCI-to-PCI bridge chip.	Make sure you are using the latest BIOS for your PCI computer. You may use the NetWare and NDIS 2.0 drivers even without PCI-to-PCI bridge chip support.

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A

Adapter Specifications

ANA-6901 and ANA-6901 Combo

Bus Interface	PCI, 32-bit bus master
Hardware Interrupts	PCI INTA, supports shared interrupts
Base I/O Addresses	Assigned by BIOS
Ethernet Node ID Number	0000D1xxxxxx
Power Requirements	+ 5 volts @ 0.5 Amp. max. (TP)
	+ 5 volts @ 1 Amp. max. (Combo)
Environmental	
Operating Temperature	0× C to 50× C
Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	Ethernet IEEE 802.3 10BASE-T
	Ethernet IEEE 802.3 10BASE-2 (Combo only)
Certifications	FCC Class B
	CE Class B
Network Speeds Supported	10 Mb/s
	20 Mb/s Full Duplex (RJ-45 only)
Network Connectors	RJ-45 female, BNC
Physical Dimensions	4.875" x 2.875" (conforms to PCI Short Card specification)
Diagnostic LEDs	Link status (green) normally on for RJ-45 connector
	Network activity (yellow) on when activity detected

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ANA-6904 and ANA-6904BNC Quartet*

Bus Interface	PCI, 32-bit bus master
Hardware Interrupts	PCI INTA, supports shared interrupts
Base I/O Addresses	Assigned by BIOS
Ethernet Node ID Number	000092xxxxxx
Power Requirements	+ 5 volts @ 2 Amp. max. (TP)
	+ 5 volts @ 3.5 Amp. max. (BNC)
Environmental	
Operating Temperature	0× C to 50× C
Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	Ethernet IEEE 802.3 10BASE-T
	Ethernet IEEE 802.3 10BASE-2
Certifications	FCC Class A
	CE A
Network Speeds Supported	10 Mb/s
	20 Mb/s Full Duplex (RJ-45 only)
Network Connectors	RJ-45 female (4), or BNC (4)
Physical Dimensions	9.75" x 4" (conforms to PCI Long Card specification)
Diagnostic LEDs	Link status (green) normally on for RJ-45 connector
	Network activity (yellow) on when activity detected

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ANA-6910/FX ST and ANA-6910/FX SC

Bus Interface	PCI 32-bit bus master
Hardware Interrupts	PCI INTA, supports shared interrupts
Base I/O Addresses	Assigned by BIOS
Ethernet Node ID Number	000092xxxxxx
Power Requirements	+ 5 volts @ 0.5 Amp. max.
Environmental	
Operating Temperature	0× C to 50× C
Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	Ethernet IEEE 802.3u 100BASE-FX
Certifications	FCC Class B
	CE Class B
Line Speeds Supported	100 Mb/s
	200 Mb/s Full Duplex
Network Connectors	ST, SC
Physical Dimensions	5.075" x 3.9" (conforms to PCI Short Card specification)
Diagnostic LEDs	Link status (green) normally on
	Network activity (yellow) on when activity detected

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ANA-6910/TX PCI

Bus Interface	PCI 32-bit bus master
Hardware Interrupts	PCI INTA, supports shared interrupts
Base I/O Addresses	Assigned by BIOS
Ethernet Node ID Number	000092xxxxxx
Power Requirements	+ 5 volts @ 0.5 Amp. max.
Environmental	
Operating Temperature	0× C to 50× C
Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	Ethernet IEEE 802.3u 100BASE-TX
Certifications	FCC Class B
	CE Class B
Network Speeds Supported	100 Mb/s
	200 Mb/s Full Duplex (PCI only)
Network Connectors	RJ-45 female
Physical Dimensions	5.075" x 3.9" (conforms to PCI Short Card specification)
Diagnostic LEDs	Link status (green) normally on
	Network activity (yellow) on when activity detected

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ANA-6911/T4 and ANA-6911/T4 Combo PCI

Bus Interface	PCI 32-bit bus master
Hardware Interrupts	PCI interrupt A, supports shared interrupts
Base I/O or Memory Address	Assigned by BIOS
Power Requirements	+5 volts @ 1.5 Amp. max
Environmental	
Temperature	0× C to 50× C
Relative Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	IEEE 802.3 10BASE-2
	IEEE 802.3 10BASE-T
	IEEE 802.3u 100BASE-T4
Certifications	FCC Class B
	CE Class B
Network Speeds Supported	10 Mb/s
	20 Mb/s Full Duplex (PCI only)
	100 Mb/s
Network Connectors	RJ-45 female, BNC
Physical Dimensions	5.075" x 3.9" (conforms to PCI Short Card specification)
Diagnostic LEDs	Link status (green) normally on, or blinking for 100 Mb/s
	Network activity (yellow) on when activity detected

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ANA-6911A/TX and ANA-6911A/TX Combo PCI

Bus Interface	PCI 32-bit bus master
Hardware Interrupts	PCI interrupt A, supports shared interrupts
Base I/O or Memory Address	Assigned by BIOS
Power Requirements	+5 volts @ 1.5 Amp. max
Environmental	
Temperature	0× C to 50× C
Relative Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	IEEE 802.3 10BASE-2
	IEEE 802.3 10BASE-T
	IEEE 802.3u 100BASE-TX
Certifications	FCC Class B
	CE Class B
Network Speeds Supported	10 Mb/s
	20 Mb/s Full Duplex
	100 Mb/s
	200 Mb/s Full Duplex
Network Connectors	RJ-45 female, BNC
Physical Dimensions	5.075" x 3.9" (conforms to PCI Short Card specification)
Diagnostic LEDs	Link status (green) normally on
	Network activity (yellow) on when activity detected

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ANA-6911/UC Ultimate Combo

Bus Interface	PCI 32-bit bus master
Hardware Interrupts	PCI INTA, supports shared interrupts
Base I/O Addresses	Assigned by BIOS
Ethernet Node ID Number	000092xxxxxx
Power Requirements	+ 5 volts @ 3 Amp. max, or
	+3.3 volts @ 5 Amp. max
Environmental	
Operating Temperature	0× C to 50× C
Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	Ethernet IEEE 802.3 10BASE-T
	Ethernet IEEE 802.3 10BASE-2
	Ethernet IEEE 802.3 10BASE-5
	Ethernet IEEE 802.3u 100BASE-T4
	Ethernet IEEE 802.3u 100BASE-TX
Certifications	FCC Class A
	CE Class A
Network Speeds Supported	10 Mb/s
	20 Mb/s Full Duplex
	100 Mb/s
	200 Mb/s Full Duplex (TX only)
Network Connectors	RJ-45 female, BNC, AUI
Physical Dimensions	6" x 3.9" (conforms to PCI Short Card specification)
Diagnostic LEDs	Link status 10/100 (yellow/green) normally on
	Network activity (yellow) on when activity detected

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ANA-6940/Quartet TX

Bus Interface	PCI 32-bit bus master
Hardware Interrupts	PCI INTA, supports shared interrupts
Base I/O Addresses	Assigned by BIOS
Ethernet Node ID Number	000092xxxxxx
Power Requirements	+ 5 volts @ 2 Amp. max
Environmental	
Operating Temperature	0× C to 50× C
Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	Ethernet IEEE 802.3u 100BASE-TX
Certifications	FCC Class A
	CE Class A
Network Speeds Supported	100 Mb/s
	200 Mb/s Full Duplex
Network Connectors	RJ-45 female (4)
Physical Dimensions	9.75" x 4.2" (conforms to PCI Long Card specification)
Diagnostic LEDs	Link status (green) normally on
	Network activity (yellow) on when activity detected

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ANA-6944A/TX Quartet

Bus Interface	PCI 32-bit bus master
Hardware Interrupts	PCI INTA, supports shared interrupts
Base I/O Addresses	Assigned by BIOS
Ethernet Node ID Number	000092xxxxxx
Power Requirements	+ 5 volts @ 2 Amp. max + 5 volts @ 3.5 Amp. max
Environmental	
Operating Temperature	0× C to 50× C
Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	Ethernet IEEE 802.3 10BASE-T
	Ethernet IEEE 802.3u 100BASE-TX
Certifications	FCC Class A
	CE Class A
Network Speeds Supported	10 Mb/s
	20 Mb/s Full Duplex
	100 Mb/s
	200 Mb/s Full Duplex
Network Connectors	RJ-45 female (4)
Physical Dimensions	9.75" x 4.2" (conforms to PCI Long Card specification)
Diagnostic LEDs	Green link status light, normally on, indicates 100TX link. Yellow link status light indicates 10T link.
	Yellow network activity light on when activity detected

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ANA-6944/T4/Quartet

Bus Interface	PCI 32-bit bus master
Hardware Interrupts	PCI INTA, supports shared interrupts
Base I/O Addresses	Assigned by BIOS
Ethernet Node ID Number	000092xxxxxx
Power Requirements	+ 5 volts @ 2 Amp. max
	+ 5 volts @ 3.5 Amp. max
Environmental	
Operating Temperature	0× C to 50× C
Humidity	5% to 85% non-condensing
Altitude	3000m maximum
Network Interface Standards	Ethernet IEEE 802.3 10BASE-T
	Ethernet IEEE 802.3u 100BASE-T4
Certifications	FCC Class A
	CE Class A
Network Speeds Supported	10 Mb/s
	20 Mb/s Full Duplex
	100 Mb/s
Network Connectors	RJ-45 female (4)
Physical Dimensions	9.75" x 4.2" (conforms to PCI Long Card specification)
Diagnostic LEDs	Link status (green) normally on, or blinking for 100 Mb/s
	Network activity (yellow) on when activity detected

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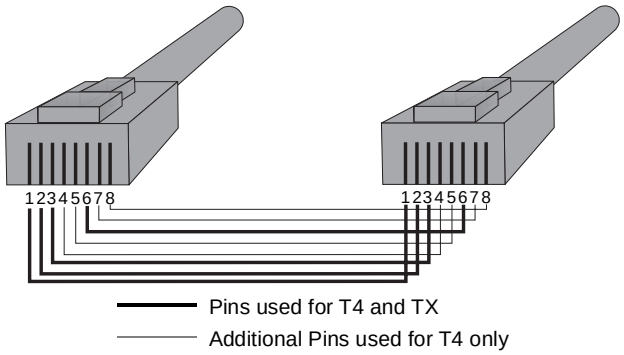
B

Cables

Twisted Pair Cable Types

Straight-through Cable

The majority of twisted-pair environments utilize twisted-pair cables that are wired straight-through. This means that each pin of the modular plug connector is wired to the same pin on the opposite end of the cable (i.e., pin 1 is wired to pin 1, etc.) Straight-through cables connect workstations and servers to repeaters and switches. Cables for 100BASE-TX use two pair (pins 1, 2, 3, and 6). Cables for 100BASE-T4 use four pairs (pins 1 through 8).



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Crossover Cable

If you do not wish to use a repeater or switch to connect servers and workstations together, you can use a crossover cable. A crossover cable connects the transmit, or TX, pins on one end of the cable to the receive, or RX, pins on the other end of the cable. Crossover cables connect workstations and servers directly, without the use of a repeater or switch. You will generally need to make your own crossover cables, or custom order them from your supplier. Cables for 100BASE-TX use two pairs (pins 1, 2, 3, and 6). Cables for 100BASE-T4 use four pairs (pins 1 through 8)

Note: All pins must be connected even if they are not used to transfer data.

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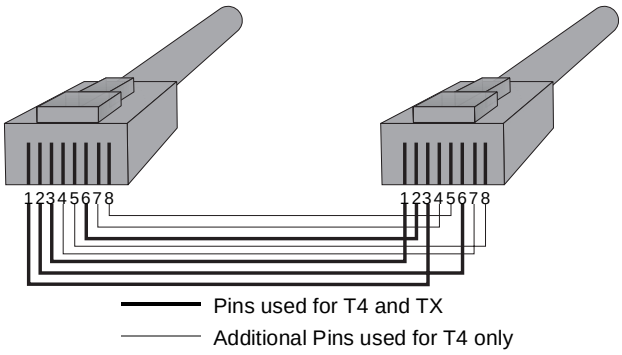

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Pinout and Color Requirements

The following tables provide cable pinout and color information.

Straight-Through Cable - 10BASE-T, 100BASE-TX, or 100BASE-T4	
Pin	**Colors - Both Ends**
1	Orange White
2	Orange
3	Green White
4	Blue
5	Blue White
6	Green
7	Brown White
8	Brown

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Crossover Cable - 10BASE-T, 100BASE-TX, 100BASE-T4		
	Pinout	
	End One	**End Two**
	Pin 1	Pin 3
	Pin 2	Pin 6
	Pin 3	Pin 1
	Pin 4	Pin 7
	Pin 5	Pin 8
	Pin 6	Pin 2
	Pin 7	Pin 4
	Pin 8	Pin 5
	Color	
Pin	**End One**	**End Two**
1	Orange White	Green White
2	Orange	Green
3	Green White	Orange White
4	Blue	Brown White
5	Blue White	Brown
6	Green	Orange
7	Brown White	Blue
8	Brown	Blue White

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